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ABSTRACT

A study was conducted to increase understanding of how postsecondary vocational education programs in Minnesota link to the labor market. The process used was to examine the types of jobs selected by program graduates and the consistency of stability in the job selection patterns among area vocational-technical institutes offering the same programs and across a four-year period. A purposive sample of nine postsecondary vocational education programs was selected to provide broad representation of the various types of programs in Minnesota. Student follow-up data for 7,654 graduates of the selected programs for the school years 1973-74 to 1976-77 was used in the analysis. A description of the types of jobs selected by the graduates of each program was developed. A new statistic, called the repeatability coefficient, was adapted from genetics research to assess the stability in job selection patterns among institutes offering the same programs and across years of the four-year time period. The results indicate that while graduates of a given program select a wide variety of different occupations and industries, a relatively small number of occupation and industry titles were needed to characterize the jobs selected by a majority of each program's graduates. Further, there was considerable variation in the stability of the job selection pattern for program graduates among institutes and time periods. Where the stability was higher, it was recommended that more confidence can be placed in using labor market demand projections for occupations related to these programs as useful information in planning vocational education. (Author/KC)

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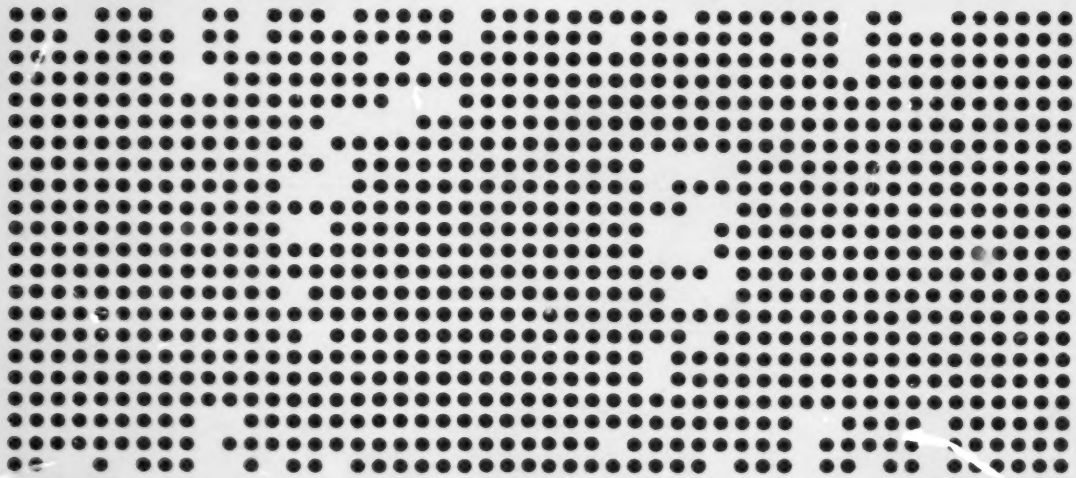
STABILITY IN JOB SELECTION PATTERNS OF POST-SECONDARY VOCATIONAL EDUCATION GRADUATES IN MINNESOTA

By M. Nagi Salem and George H. Copa



October, 1981

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PREFACE

This publication is another result of efforts by the Minnesota Research and Development Center for Vocational Education to better understand the linkage between vocational education and the labor market. It is the second report which focuses specifically on describing the pattern of jobs selected by graduates of Minnesota's post-secondary, full-time vocational education programs. By analyzing the consistency or stability of job selected by graduates among institutions with the same type of programs and over a four year period, implications are drawn for using labor market information in planning vocational education.

The Center wishes to especially thank Nagi Salem for contributing his time to conduct the study and report its results -- the time and commitment required turned out to be much more than any of us expect. The study would also not have been possible without the cooperation of Dolores Pospesel and the staff of Educational Management Services, Inc. in providing access to the needed data from the Minnesota Vocational Follow-Up System.

George H. Copa

ABSTRACT

Vocational education programs are expected to be planned in the context of labor market requirements. Such planning can be improved by knowledge of labor market demand and the way in which vocational education programs serve to meet the demand. The purpose of this study was to increase understanding of how post-secondary vocational education programs in Minnesota link to the labor market. The process used was to examine the types of jobs selected by program graduates and the consistency or stability in the job selection patterns among area vocational-technical institutes offering the same program and across a four year period. The benefit of increased understanding was in more appropriately using labor market information, particularly demand projections, in planning vocational education.

A purposive sample of nine post-secondary vocational education programs was selected to provide broad representation of the various types of programs in Minnesota. Student follow-up data for 7,654 graduates of the selected programs for the school years 1973-74 to 1976-77 was used in the analysis. A description of the types of jobs selected by the graduates of each program was developed. A new statistic, called the repeatability coefficient, was adapted from genetics research to assess the stability in job selection patterns among institutes offering the same programs and across years of the four year time period.

The results indicate that while graduates of a given program select a wide variety of different occupations and industries, a relatively small number of occupation and industry titles were needed to characterize the jobs selected by a majority of each program's graduates. Further, there was considerable variation in the stability of the job selection pattern for program graduates among institutes and time periods. Where the stability was higher, it was recommended that more confidence can be placed in using labor market demand projections for occupations related to these programs as useful information in planning vocational education.

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Chapter I.

INTRODUCTION

In the United States, centralized planning has not been used to control the supply of skilled and semi-skilled workers to the labor market; rather, individual freedom of choice is a major determinant of the characteristics of labor market supply. Educational programs designed to prepare people for successful participation in the labor market are a major influence on the characteristics of labor supply. Recently, there has been a renewed concern for planning of these programs as a result of: (1) the need for efficient utilization of the limited financial resources available to educational institutions, (2) the concern of educational administrators with accountability, (3) the competition among human services programs for the same pool of resources and (4) the requirements of federal legislation.

Vocational education is one of the educational programs designated specifically to prepare people for the labor market. It is widely accepted that the major purpose of vocational education, especially at the post-secondary level, is to prepare and upgrade individuals so that they may enter into and remain effective in the world of work. In meeting this purpose, the planning of vocational education programs involves consideration of both the needs of prospective students and those of employers.

The design of plans for vocational education necessitates decisions about what programs to provide, how many programs, where to locate programs, and when programs should be scheduled. These decisions, in turn, require information about both prospective students (labor supply) and prospective employers (labor demand). On the labor demand side, the information needed includes the number of work positions available, when and where they are available and the vocational preparation required for these positions. On the supply side, the information needed is the number of people who want to work, where and when they desire to work, and their needs, interests and abilities.

The link between vocational education and the labor market has been made explicit by federal legislation. The states are mandated to offer programs that should be "...realistic in the light of actual or anticipated

opportunities for gainful employment..." The most recent federal legislation also emphasized the importance of planning for vocational education in relation to the labor market. Public Law 94-482, the Education Amendment of 1976, mandated states to prepare a five-year and annual plans for vocational education which must"...assess the current and future needs for job skills within the state...through consideration of the latest available data on present and projected employment..."

Stability of Job Selection Patterns and Planning of Vocational Education

One of the requirements in preparation of a state plan for vocational education is the relating of training programs and occupations. Documentation of this relationship could be easily accomplished if those leaving a specific vocational education program entered only one occupation consistently year after year. In reality, this is not true. First, graduates of several programs may select the same occupation and, conversely, graduates of one program may select several different occupations depending on the specificity of programs, the requirements of the occupation and the choice of graduates. Second, there may be a variation over time (years) in occupations selected by specific program graduates. Given this context, a description and analysis of the past behavior of vocational program graduates in terms of occupations and industries selected should aid the vocational planners in answering the basic questions about planning for vocational programs (i.e., what, when, where, and how much) as well as assessing the impact of vocational education programs on the labor market. From this point on in this study, occupation will refer to major job functions (e.g., carpenters, bookkeepers, sales clerks) and industry will refer to the type of goods or services produced where the job functions are performed (e.g., hospitals, department store, and banks).

Given a description of the relationship between training programs and job selection, the next prerequisite for reliable planning is that this relationship remain stable among programs of the same type and for these programs over time. Only if there is some stability to the pattern of jobs selected would there be a basis for any planning into the future.

The first attempt at describing the pattern of jobs selected by vocational education program graduate and assessing the pattern's stability

over time, was reported by Copa and Kleven (1977) in a study entitled Job Selection Patterns: Linkage Between Vocational Education Programs and the Labor Market. The study focused on a sample of seven post-secondary vocational education programs in Minnesota. They utilized the chi square statistic to determine if the proportion of graduates from each of the programs who selected a series of occupations and industries remained stable over a three year period. One of the recommendations made as a result of the study was to identify or develop new means of displaying and comparing job selection patterns. More specifically they pointed out that the chi square analysis proved to have several limitations in comparing patterns for the same program over time and comparing different programs for the same period.

The major purpose of this study was to explore an alternative type of statistical analysis for describing the stability of the job selection pattern for a given vocational education program and for comparing the stability of the pattern among different programs and among schools offering the same program. Only the occupation and industry dimensions of the job selection pattern will be analyzed; several other dimensions of the pattern had been envisioned by Copa and Kleven. A secondary purpose was to investigate the possibility of grouping jobs on the bases of their relatedness to a given vocational education program as a way to simplify the communication of degree of stability in the job selection pattern. The previous research by Copa and Kleven (1977) had suggested that it would be useful to group jobs in order to feasibly assess the stability of the job selection pattern because in some instances the number of graduates from specific programs may be small or graduates may select a very wide variety of jobs, thereby resulting in a very small number in any one job.

Purpose of the Study

The purposes of this study were:

(1) Describe the jobs selected by graduates from a sample of post-secondary vocational education programs in Minnesota.

(2) Assess the stability in jobs selected by the graduates from schools offering the same type of program and for a given program over several years.

The result of the study should aid in developing a process for assessing the appropriateness of detailed planning of particular vocational education programs on the basis of labor market information.

Chapter II.

CONTEXT FOR STUDY

This chapter first provides a brief description of the general context within which one might formulate "reasonable" expectations for the stability of job selection patterns for vocational education programs. Second, it provides more description of two previous studies which were forerunners to the study reported here.

General Context for Viewing Job Selection by Vocational Education Graduates

Work may be considered the core of purposeful human activities; with the exception of sleep, work occupies more time than any other activities for most adults between the age of 19 and 65. Not only does work provide a means to earn a living, but it also satisfies many of the basic human needs such as physical and mental activities, sociability, security, status and self-esteem. Given the importance of work to the individual and the technological changes which brought about a diversity of occupations from which to choose, several theories had been proposed to explain the process of vocational development and choice.

The reoccurring theme among the vocational development and career choice theories advanced by Ginzber, et. al. (1951), Roe (1959), Super (1953 and 1957), Hoppock (1976) was that occupational choice is a developmental, dynamic, life long process. According to the vocational development and choice theories, it appears that the process of choosing a career or a job is a very complex task and is influenced by many factors. Consequently, it is unrealistic to expect that every graduate from a specific vocational program will select a job which is closely related to the program. Some of the diverse factors which have been found to correlate with vocational choice from the perspective of the person making the choice are: the culture, community, social class, place of residence, racial background, family, school, heredity, body build, development of endocrine glands, aptitude, interest, personality, age and sex (Crites, 1969). Wages

offered for a given job may also be a determining factor in vocational choice. Freeman (1971) proposed an economic theory of vocational choice. He stated that an individual choice of an occupation is influenced by two sets of factors: (1) preference and abilities; and (2) wages and job characteristics. He argued that within the limit of individual ability, an individual will select the job which maximizes his/her utility function.

Other characteristics of labor demand also play a role in job selection. With the absence or slow demand for workers in a specific occupation, it may be very difficult for individuals interested in such occupations to be employed in their first choice occupation. Tomorrow's Manpower Needs, a publication of the U. S. Department of Labor (1969), lists the factors affecting the national occupational structure and, subsequently the demand for workers. The factors listed were as follows: (1) the policy of the Executive Branch of the government and Congress, (2) the rate of growth in various industries, (3) the technological advances in industries that lead to alternation in the size of employment in occupations affected by change in technology, (4) the replacement need for workers that leave the labor force because of retirement, death, and change of occupations, (5) wages and substitution of workers with similar skills, and (6) licensure requirements for entry into specific occupations and the union-management relationship. These and probably many other factors affect state and more local labor markets for workers. The point is that the complexity of vocational development and choice as it affects labor supply and occupational structure as it affects labor demand make it naive to expect simple one-to-one relationships between vocational education programs and jobs selected by graduates. Even more naive would be the expectation that this relationship is completely rigid (stable) from year to year or even school to school for similar types of programs.

Assessment of the Stability of Job Selection Patterns

Only two studies were identified in which the stability of job selection by graduates of vocational education was analyzed cross-sectionally over time for several groups of graduates. Eninger (1965) compared labor market characteristics of former high school students from different graduating classes using mean data for school and correlation procedures.

In assessing the stability of job relatedness between years of graduation, he found that the stability coefficients between graduates of the class of 1953 and the class of 1958 was .60, between graduates of the class of 1953 and 1962 was .49, and between graduates of 1958 and 1962 was .55. All of the correlations reported as stability coefficients were statistically significant at the 5 percent level.

Copa and Kleven (1977) define a "job selection pattern" as a way to describe the jobs entered by group of program graduates. They viewed a job selection pattern as having five dimensions: size (number of graduates selecting a particular job), occupation (type of work done), industry (type of firm in which work is done), geographic area (where work is done), and time (when work is done). As a part of their study of post-secondary vocational education programs in Minnesota, they used chi square analysis to determine if the proportion of graduates selecting a series of occupations remained stable over three years for a sample of programs. The findings indicated that the number of occupations and industries selected varied by program. There was a unique pattern of jobs selected for each program with some overlap in jobs between programs. Some aspects of the selection pattern were stable while others were not stable.

Chapter III.

METHOD OF STUDY

This chapter introduces a model for assessing the stability over time of jobs selected by graduates from post-secondary vocational programs. The description of the model includes the theoretical framework for development of the model. The research procedures used to implement the model are described in terms of the instrument used, selection of the sample, and coding of the data.

Model for Assessing the Stability of Job Selection Patterns

A simple interclass correlation provides a tool for measuring the degree of association between two measures of the same variable taken at two different times. This correlation coefficient can be utilized as a measure of the stability in a variable's behavior (i.e., does it retain the same value). The higher the correlation coefficient, the more stable the behavior of the variable. However, when more than two measurements are taken (as when the status of a variable is to be compared over three or more different times), the calculation of interclass correlation becomes cumbersome since these correlations can be calculated only between two pairs of measurements on a variable. In addition, the interclass correlation does not provide for a composite measure of the overall correlation between all possible pairs of measurements on the variable of interest.

The intraclass correlation between repeated measurement over time is a method for calculating a composite measure of the overall correlation between all possible pairs of measurement. This intraclass correlation coefficient is referred to as repeatability coefficient (Becker, 1967). This statistic is more commonly used in quantitative genetic research to indicate the extent to which observed differences in measured traits will be repeated in future times. An important assumption implicit in the idea of repeatability is that repeated measurement are indeed measured under the same conditions.

The model proposed here for assessing the stability of job selection

patterns over time is based on the application of the concept of repeatability. The program within each school is considered a measurement unit for estimating the repeatability coefficient of selecting a specific job by graduates of the program. In other words, each measurement of a school over a period of years is made up of the proportion of graduates from a specific program area who selected a specific job.

The assessment of intraclass correlation between repeated measurement can be conducted by using analysis of variance. A detailed explanation of the statistical model utilized for calculating the repeatability coefficients and an example of the calculation is given in Appendix I.

Collection of Data

This section focuses on description of the instrument employed in the study, criteria for selection of program to be included in the sample and procedures for coding information from the follow-up questionnaire.

Instrument

The Minnesota Vocational Follow-up System provided data for this study. In this system, graduates from the 33 Area Vocational Technical Institutes in Minnesota are followed-up one year after graduation with a mailed questionnaire. The follow-up data included a description of the graduate's first job in terms of occupation and industry and the same information for the job held after one year (if the graduate had changed jobs). Also the follow-up data includes the graduate response to whether the first and present job held was related to his/her program of training. A copy of the follow-up questionnaire is shown in Appendix II.

Sample

A sample of nine post-secondary vocational education programs was selected for this study. The criteria used in selecting the sample were:

(1) Representation by all seven traditional vocational education service areas (i.e., agriculture, business and office, distributive, health, home economics, technical, and trade and industrial education).

(2) Uniformity of program at all schools which offer the program in

terms of purpose, program length, and curriculum.

(3) Minimum of five schools offering the program thereby allowing comparison among schools over a period of years.

(4) Representation by the following occupational categories: technical workers, sales workers, clerical workers, craft workers, operatives and service workers.

(5) Representation by programs which enroll predominantly females, predominantly males, and approximate equal proportions from each sex.

As a result of applying these criteria, the selected nine programs were electronic technology, welding, carpentry, accounting, practical nursing, fashion merchandising, child development, landscape technology and farm power equipment mechanics. The characteristics of each program selected are as follows:

(1) Electronic Technology. This program represents the technical area. The length of the program is about 22 months. The program is offered by 20 schools. Electronic technicians and craft workers are occupations prepared for by the program. The majority of graduates are male.

(2) Welding. This program represents the trade and industrial area. The length of the program is about 10 months. The program is offered by 24 schools. Operatives' occupations are prepared for by this program. The graduates are predominantly male.

(3) Carpentry. This is another program that represents the trade and industrial area. The length of the program is about 18 months. The program is offered by 17 schools. Craft workers' occupations are prepared for by the program. Graduates are largely male.

(4) Accounting. This program represented the business and office area. The length of the program is about 20 months. The program is offered by 28 schools. Accounting and clerical occupations are prepared for by the program. Graduates are both male and female.

(5) Practical Nursing. This program represents the health area. The length of the program is about 11 months. The program is offered by 21 schools. Service occupations are prepared for by

the program. The majority of graduates are females.

(6) Fashion Merchandising. This program represents the distributive area. The length of the program is about 18 months. This program is offered by 9 schools. Sales workers' occupations are prepared for by the program. Graduates are largely female.

(7) Child Development. This program represents the home economics area. The length of the program is about 9 months. The program is offered by 6 schools. Service workers' occupations are prepared for by the program. The majority of graduates are female.

(8) Landscape Technology. This program represents the agriculture area. The length of the program is about 11 months. The program is offered by 5 schools. This program prepares laborers and craft workers for their occupations. Graduates are predominantly male.

(9) Farm Power Equipment Mechanics. This is another program that represents the agriculture area. The length of the program is about 20 months. The program is offered by 7 schools. This program prepares craft workers and farmers for their occupations. The majority of graduates are male.

Coding of Data

The original follow-up questionnaires of graduates from the nine selected programs from the four school years (1973-74 to 1976-77) were acquired from the Minnesota Vocational Follow-Up System. The number of useable follow-up questionnaires was 7,654 representing 28 schools.

Three clerks were trained to code the job descriptions by occupation and industry categories using the U.S. Bureau of Census "Alphabetic Index of Industries and Occupations" (1971). This index divided occupations and industries into 439 and 228 categories, respectively. The Census classification system for occupations and industries was used because the follow-up questionnaires asks questions concerning occupations and industries in a similar format to that used by the Census Bureau; therefore, enough information about the jobs held by graduates was available to use the coding scheme appropriately.

Statistical Analysis

Simple frequency distribution were used to describe the number of graduates selecting particular occupations and industries for each program as well as relatedness of job selected to program of training. Frequency distribution were compiled for each of the four years as well as the entire period. Stability of job selection was assessed using the repeatability coefficient model. The integrated statistical package entitled the Statistical Package for the Social Sciences or SPSS provided the capability for analysis.

Chapter IV.

RESULTS OF ANALYSIS

The focus of this study was on (1) describing jobs selected by graduates of a sample of nine post-secondary vocational programs, and (2) assessing the stability of jobs selected by graduates from each program over a four-year period. Each of these purposes is treated as a separate major section of this chapter.

Description of Jobs Selected

Three dimensions (i.e., occupations, industry and frequency of selection) were used to describe jobs held by vocational education program graduates one year after graduation. The decision to report jobs held one year after graduation was based on the assumption that one year allowed for changes in jobs held by graduates (i.e., if graduate did not like the job, they had time to change; if graduate couldn't perform the job, they were let go) and therefore reflect a more stable indication of the program's graduates impact on the labor market.

The number of specific occupations and industries selected by graduates over a four-year period is shown in Table 1. For example, out of 439 occupations and 228 industries listed in the "Alphabetic Index of Industries and Occupations" which was used for coding purposes, the 1032 graduates from the electronics technology program selected 103 different occupations and 107 different industries. Variations in the number of different occupations and industries selected by graduates of different programs in the sample is attributed to factors such as: (1) differences in program focus (i.e., broad versus narrow in terms of the number of different jobs in which the training would be useful), (2) variation in specificity of subdivision among occupation and industry categories in the Census classification system, and (3) job entry requirements such as licensing examinations.

In order to provide description of jobs selected by graduates,

Table 1

Number of Different Specific Occupations and Industries Selected by Graduates of School Years 1973/74 to 1976/77

Programs	Number reporting occupation	Number of different specific occupations used	Number reporting industry	Number of different specific industries used
Electronic technology	1032	103	1007	107
Welding	1019	103	963	109
Practical nursing	2045	45	2043	52
Carpentry	680	60	683	69
Accounting	1399	105	1265	152
Child development	466	31	465	60
Fashion merchandising	313	59	308	70
Landscape technology	328	59	325	56
Farm equipment mechanics	190	35	179	30

Table 2 lists the frequency of each occupation and industry selected by at least five percent of the graduates from each program over a four-year period. A relatively small number of specific occupations and industry titles encompasses the jobs selected by about 60 percent of the graduates from each program. Therefore, it is apparent that although a large number of different specific occupations and industries were selected by graduates of a particular program, most of the graduates were concentrated in relatively few occupations and industries. For example, although the electronic technology program graduates had selected jobs in 103 different occupations and 107 different industries, Table 2 shows that only six occupations and three industries were selected by more than five percent of the graduates.

The occupations and industries listed in the Census classification scheme are grouped into 10 major occupational categories and 11 major industrial categories. Table 1 through Table 18 in Appendix III provides information about the rate of selection of major occupational and industrial categories for graduates from each program area for each year of the four-year period.

Following is a summary of the findings concerning the description of jobs selected by graduates of each program in the sample as shown in Table 2 and Appendix III.

Electronic Technology

Six specific occupations accounted for the selection of about 55 percent of the graduates from the electronic technology program. About 26 percent of the graduates were employed as electrical and electronic technicians. Three industries, namely, electronic computing equipment; radio, television and communication equipment; and household appliance stores were selected by about 47 percent of the graduates over a four-year period.

The major occupational categories of professional, technical workers and craft workers were selected by about 82 percent of the graduates with an approximate equal distribution between the two categories. No other occupational category accounted for the selection of over 4 percent of the graduates except the managers and administrators category where 4.4 percent of the graduates were employed.

Table 2

Most Frequently Selected Occupations and Industries by Graduates of Sample Vocational Education Programs for School Years 1973/74 To 1976/77

Occupations	Percent selecting occupation	Industries	Percent selecting industry
	Electronic technology		
Electrical and electronic technicians	25.6%	Electrical computing equipment	23.0%
Industrial engineering technicians	5.9	Radio, TV and communication equipment	12.7
Engineering and science technicians, n.e.c.	6.8	Household appliance, TV and radio store	11.7
Radio and television repairman	5.9		
Data processing machine repairman	5.1		
Miscellaneous mechanical repairman	5.9		
	Welding		
Welders and flame-cutters	54.8%	Fabricated structural metal products	5.8%
		Machinery, except electrical, n.e.c.	9.8
		Not specified manufacturing industries	16.0
	Practical nursing		
Practical nurses	92.9%	Hospitals	69.6%
		Convalescent institutions	19.1

Table 2 (cont.)

Occupations	Percent selecting occupation	Industries	Percent selecting industry
Carpentry			
Carpenters	69.1%	General building contractors	32.9%
Managers and administrators, n.e.c.	6.0	Not specified contractor	35.1
Accounting			
Accountants	11.5%	Banking	9.4%
Bookkeepers	28.8		
Secretaries, n.e.c.	5.1		
Miscellaneous clerical workers	7.1		
Child development			
Teacher aides	45.9%	Elementary and secondary schools	49.6%
Child care workers	9.4		
Fashion merchandising			
Sales managers, retail trade	10.2%	Department and mail order establishment	20.1%
Managers and administrators, n.e.c.	13.7	Apparel and accessories stores	17.5

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Table 2 (cont.)

Occupations	Percent selecting occupation	Industries	Percent selecting industry
Sales clerks, retail trade	34.2%	Not specified retail trade	15.3%
	Landscape technology		
Managers and administrators, n.e.c.	9.1%	Horticultural services	45.5%
Supervisors, n.e.c.	9.5	Misc. entertainment and recreation service	10.2
Gardener and groundskeepers	32.9		
Farm laborers, wage workers	7.0	Local public administration	5.5
	Farm equipment mechanic		
Farm implement mechanic	32.1%	Agriculture production	24.6%
Heavy equipment mechanic	6.3	Hardware and farm implement stores	43.6
Misc. mechanic and repair workers	14.3		
Farmers (owner and manager)	6.8		
Farm supervisors	10.0		

Three major industrial categories accounted for the employment of about 84 percent. About 55 percent worked in manufacturing; about 19 percent worked in wholesale and retail trade industries; and another 10 percent worked in the industrial category of transportation, communication and public utilities. All other major industrial categories were represented in the graduates' selection; however, 5 percent or less of graduates selected each of those categories.

Welding

The occupation of welders and flame cutters was selected by about 55 percent of the graduates. This occupation is included in the major occupational category of operative where about 66 percent of the graduates were employed. The two major occupational categories of crafts workers and laborers were selected by 15.7 and 6.3 percent of the graduates, respectively.

The manufacturing industrial category was a prime choice for welding graduates; about 62 percent of the graduates selected this category. Between 5.5 and 8.1 percent of the graduates selected industries in the major industrial categories of business and repair services; transportation, communication and public utilities; wholesale and retail trade; and construction.

Practical Nursing

This is a very specialized program. About 93 percent of the graduates were employed as licensed practical nurses. Hospitals employed about 70 percent of the graduates while convalescent institutions employed about 19 percent. The predominant employment in a single occupation may be due to the licensing requirement in addition to the program specialization. The above selection was reflected in occupational and industrial categories where about 95 percent were employed as services workers in the major industrial category of professional and related services. Wholesale and retail trade industries was the second choice with only 4 percent of the graduates.

Carpentry

This is another narrow focus program tailored for employment in a

specific occupation. About 69 percent of the graduates selected the occupation of carpenter. The general building contractors industry accounted for about 33 percent of the graduates' selection and the non-specified contractors industry employed another 35 percent of the graduates.

Given the selection of the carpenter occupation by 69 percent of the graduates, a total of about 78 percent selected the major occupational category of crafts workers. Managers and administrators and laborers were the next highest major occupational categories selected by about 6 percent of the graduates for each category. No other major occupational categories accounted for more than 3.8 percent of the graduates.

The construction, manufacturing, and wholesale and retail trade major industrial categories employed 76.4, 8.6, and 6.3 percent of the graduates, respectively. All other major industrial categories were selected by graduates with percentages that varied between 0.1 and 2.5 percent.

Accounting

Four specific occupations and only one industry were selected by more than 5 percent of the graduates. The occupations of accountants, bookkeepers, secretaries, and miscellaneous clerical workers were selected by 11.5, 28.8, 5.1 and 7.1 percent of the graduates over a four-year period. The banking industry was selected by 9.4 percent of the graduates.

The pattern of distribution among major occupational and industrial categories was unique to the accounting program. The major occupational category, clerical workers, represented 64.3 percent of the graduates followed by the professional and technical category with 12 percent and the managers and administrators category with about 7 percent. No other major occupational category accounted for over 5 percent of the job selection except operatives with 5.6 percent. On the other hand, there was more spread in the industrial categories distribution: wholesale and retail trade with 28.6 percent; manufacturing with 21.6 percent; finance, insurance and real estate with 14.9 percent; professional and related services with 14.2 percent; and public administration with 7.8 percent.

Child Development

About 46 percent of the graduates from the child development program were employed as teacher aids and about 10 percent as child care workers. Elementary and secondary schools employed about 50 percent of the graduates.

Two major occupational categories were important to graduates of this program. The occupation of clerical worker was selected by 5.8 percent and service workers was selected by approximately 26 percent. Operatives was the only other major occupational category selected by over 5 percent of the graduates. The major industrial category, professional and related services, accounted for 67.3 percent of the graduates and wholesale and retail trade for 13.5 percent.

Fashion Merchandising

The occupation of salesclerks was selected by 34.2 percent of the graduates while the sales manager's occupation was selected by 10.2 percent. Three industries in the retail trade were selected by about 53 percent of the graduates. The three important major occupational categories for graduates from this program were managers and administrators, sales workers and clerical workers. They were selected by 26.8, 36.4, and 18.2 percent of graduates, respectively. The major concentration was found in the major industrial category, wholesale and retail trade where about 74 percent of the graduates were employed. Other important major industrial categories were manufacturing and professional and related services which were selected by 8.8 and 6.2 percent of the graduates, respectively.

Landscape Technology

The gardeners and groundskeepers occupation accounted for approximately 33 percent of the graduates. Three other occupations were selected by more than 5 percent of the graduates. The horticultural services industry employed about 46 percent of the graduates. With the exception of professional and technical workers and private household workers categories, at least 4 percent of the graduates selected jobs from other major occupational categories -- laborers with about 40 percent, crafts workers with about 15 percent and operatives with about 9 percent.

Agriculture, forestry, and fisheries was the major industrial category where approximately 46 percent of the graduates were employed. Other major industrial categories which employed about 10 percent of the graduates include manufacturing, wholesale and retail trade, and professional and related services.

Farm Power Equipment Mechanics

Five occupations accounted for the selection of about 70 percent of the graduates. Out of this percentage approximately 32 percent were farm implement mechanics and about 17 percent were farmers and farm supervisors. Graduates were predominantly employed in two industries -- agriculture production with about 25 percent and hardware and farm implement stores with about 44 percent. Crafts workers, farmers and operatives were the major occupational categories chosen by graduates; these categories were the choice of 60.0, 21.6 and 8.9 percent of the graduates, respectively.

The corresponding major industrial categories selected by graduates were wholesale and retail trade; agriculture, forestry and fisheries; and manufacturing. These major industrial categories employed 54.2, 25.2 and 8.9 percent of the graduates, respectively.

Relatedness of Jobs Selected to Program of Training

Relatedness of job to training is another way to describe jobs. Graduates were asked to respond on the follow-up questionnaire to the question of whether they thought their job was related to their prior vocational education training or not. This method has the advantages of classifying jobs into two groups only. In addition, former students are supposedly in the best position to judge the relationship between skills acquired in their training program and functions required to perform on the job.

Use of graduates as a source of information on job relatedness to program of training was found by Rossmann (1977) to be consistent with other ways of deciding relatedness. She found a high correlation between the graduate reporting measure of relatedness of job selected and other measurement schemes using documents such as (1) the researcher's classification of skills/knowledge, (2) a prestige level classification, and

(3) classification using the Dictionary of Occupational Titles.

The percentage of graduates employed in related jobs over a four-year period as shown in Table 3 ranged from 63.7 percent for graduates of child development programs to 96.1 percent for graduates of practical nursing programs. Approximately 85 percent of graduates in electronic technology, carpentry, and farm equipment mechanics programs were employed in a related job.

Fluctuation in the percent of graduates from the same program who selected related jobs did occur over the four year period. For example the maximum variation between years for graduates who held related jobs from the practical nursing programs was 2.6 percent and for both landscape technology and farm equipment mechanics program it was about 13 percent.

Stability of Job Selection Patterns

A major objective of this study was to assess the stability of jobs selected by different program graduates over four consecutive years. Such assessment is important to meaningful planning of vocational education in relation to labor market needs; higher levels of stability of jobs selected in the past indicates more confidence can be placed in predicting future behavior of graduates in job selection on the basis of past behavior. The repeatability coefficient was used as an index for assessing the stability of the proportion of graduates from a program who selected certain jobs. Measuring the stability of job selection in terms of the repeatability coefficient allowed deriving an index which had a value range from zero to one and thereby provided a means for comparing the degree of stability among program areas (e.g., agriculture, industrial, health) as well as the various schemes of job classification (e.g., occupation, industry, relatedness of job to training) within a given program area.

Details of the methodology used to calculate the repeatability coefficient are given in Appendix I. The number of schools utilized in the analysis for each program was the same as given in the description of programs selected for this study (see Chapter III).

The repeatability coefficients for job selection by graduates

Table 3

Number and Percent of Graduates Reporting Employment in Jobs Related to Training for School Years 1973/74 to 1976/77

Program		Employment in jobs related to training				
		1973/74	1974/75	1975/76	1976/77	Total
Electronic technology	%	84.6	81.6	83.0	88.3	84.1
	N	247	261	311	213	1032
Welding	%	75.1	73.2	68.0	74.6	71.9
	N	193	179	391	256	1019
Practical nursing	%	96.3	97.8	95.7	95.2	96.1
	N	725	318	651	351	2045
Carpentry	%	82.2	83.0	84.9	93.9	85.4
	N	180	188	185	131	684
Accounting	%	77.2	78.6	75.7	82.7	78.5
	N	347	323	387	342	1399
Child development	%	70.7	61.6	62.7	65.7	63.7
	N	140	99	134	93	466
Fashion merchandising	%	71.8	67.8	61.4	72.7	67.2
	N	78	90	101	44	313
Landscape technology	%	81.4	79.8	67.6	68.0	73.5
	N	59	89	105	75	328
Farm equipment mechanics	%	87.1	92.2	80.6	78.9	85.1
	N	31	64	36	57	188

from the nine post-secondary vocational programs are shown in Table 4 through Table 9. The coefficients are shown for: (1) most frequently selected occupation, (2) most frequently selected industry, (3) most frequently selected major occupational category, (4) most frequently selected major industrial category, (5) most frequently selected combination of major occupation and industry category, and (6) selection of jobs related to training program. For each entry (usually an occupation or industry) in the tables, information is presented on the percent of graduates selecting the entry, the repeatability coefficient for selection, and the standard error of the coefficient.

The repeatability coefficient is independent of the frequency or rate at which graduates selected a particular job; that is stability can be low if a large proportion of graduates select a particular job or if a small proportion select the job. Rather, the repeatability coefficient is based on the degree of variation between schools in comparison to the variation for the same school over the four years. Hence, a low repeatability coefficient is caused by a larger variation for the same school over the years relative to the variation between schools.

Stability of the Selection of Most Frequent Occupation and Industry

In every vocational program in the sample, where it was possible to estimate the repeatability coefficient for the most frequently selected occupation and industry, the stability of selection of the industry was higher than that for selection of an occupation as shown in Table 4 and 5. The reason is thought to be that graduates could select several different occupations in a particular industry. The most striking difference between the stability of selection of a specific occupation and a specific industry was for the practical nursing program. The repeatability coefficient for the practical nurse occupation selected was .26 while that for working in hospitals and convalescent institutions were .54 and .47, respectively.

The repeatability coefficients for the selection of most frequency occupation ranged from .24 for graduates of the welding programs who selected the occupation of welders and flame cutters to .56 for graduates from the landscape technology program who selected the occupation of gardeners and groundskeepers. As for the selection of specific

Table 4

Repeatability Estimates for Most Frequently Selected Occupation for Each Program

Program	Most frequently selected occupation	% Selecting occupation	Repeatability coefficient	Standard error
Electronics technology	Electrical and electronic tech.	25.6	.41	.08
Welding	Welders and flame cutters	54.8	.24	.06
Practical nursing	Practical nurse	92.9	.26	.06
Carpentry	Carpenters	69.1	.28	.08
Accounting	Bookkeepers	28.8	.34	.06
Child development	Teacher aides	45.9	.33	.13
Fashion merchandising	Sales clerks	34.2	.42	.13
Landscape technology	Gardeners and groundskeepers	32.9	.56	.18
Farm equipment mechanics	Farm implement mechanics	32.1	.24	.12

Table 5

Repeatability Estimates for Most Frequently Selected Industry for Each Program

Program	Most frequently selected industry	% Selecting industry	Repeatability coefficient	Standard error
Electronics technology	Electronic computing equipment	23.0	.58	.08
Practical nursing	Hospitals	69.6	.54	.08
Practical nursing	Convalescent institutions	19.1	.47	.08
Child development	Elementary and secondary schools	49.6	.46	.15
Landscape technology	Horticultural services	45.5	.71	.15
Farm equipment mechanics	Hardware and farm equipment store	43.6	.43	.15

industries, the repeatability coefficient ranged from a low of .43 for graduates of farm equipment mechanics program selecting the hardware and farm equipment store industry to a high of .71 for graduates of the landscape technology program selecting jobs in the horticultural services industry.

Stability of the Selection of Most Frequent Major Occupational and Industrial Category

Estimates of the repeatability coefficients for selected jobs grouped on the basis of major occupational and industrial category as shown in Table 6 and 7 resulted in coefficients which were not higher than the coefficients obtained for single occupations and industries as shown in Table 4 and 5. For example, a comparison between the selection of the single occupation, electrical and electronic technicians, and the major occupational category, professional and technical workers, reveals that the repeatability coefficients were .41 and .42, respectively. Similar results were observed for the industrial categories.

In general, there was less variation in repeatability coefficients for major occupational categories among the program areas than that for major industrial categories. The repeatability coefficients for occupational categories ranged from .23 for graduates of the welding program who selected the major occupational category of operative workers to .53 for graduates of the landscape technology program who selected the major occupational category laborers. The repeatability coefficients for major industrial categories ranged from .19 for graduates of the accounting program who selected jobs in the major industrial category of wholesale and retail trade to .71 for graduates of the landscape technology program who selected jobs in the major industrial category of agriculture, forestry and fisheries.

Stability of the Selection of Most Frequent Combination of Major Occupational and Industrial Category

The results of calculating nine repeatability coefficient for the combination of major occupational and industrial category covering the jobs selected by the largest number of graduates are shown in Table 8. This information for the combination of major occupational and industrial categories provides a description of the stability of jobs selected in

Table 6

Repeatability Estimates for Most Frequently Selected Major Occupational Category for Each Program

Program	Most frequently selected major occupational category	% Selecting industry	Repeatability coefficient	Standard error
Electronics technology	Professional, technical workers	40.6	.42	.08
	Crafts workers	41.7	.39	.08
Welding	Operative workers	66.1	.23	.06
Practical nursing	Service workers	96.7	.44	.08
Carpentry	Crafts workers	77.9	.38	.09
Accounting	Clerical workers	64.3	.40	.07
Child development	Clerical workers	57.9	.27	.12
	Service workers	25.5	.27	.12
Fashion merchandising	Managers, administrators	26.8	.40	.13
	Sales workers	36.4	.35	.12
Landscape technology	Laborers	39.9	.53	.18
Farm equipment mechanics	Crafts workers	60.0	.37	.15

Table 7

Repeatability Estimates for Most Frequently Selected Major Industrial Category for Each Program

Program	Most frequently selected major industrial category	% Selecting industry	Repeatability coefficient	Standard error
Electronics technology	Manufacturing	54.8	.48	.08
Practical nursing	Professional and related services	96.6	.31	.07
Carpentry	Construction	76.4	.44	.09
Accounting	Manufacturing	21.6	.37	.06
	Wholesale and retail trade	28.9	.19	.05
	Professional and related services	14.2	.35	.06
Child development	Professional and related services	67.1	.56	.15
Landscape technology	Agriculture, forestry and fisheries	45.8	.71	.15
Farm equipment mechanics	Wholesale and retail trade	54.2	.31	.14

Table 8

Repeatability Estimates for Most Frequently Selected Combination of Major Occupational and Industrial Category

Program	Most frequent combination of occupational and industrial category	% Selecting job	Repeatability coefficient	Standard error
Welding	Operatives in manufacturing	51.8	.32	.07
Practical nursing	Service workers in professional and related service	95.7	.29	.07
Carpentry	Crafts workers in construction	67.7	.41	.09
Accounting	Clerical workers in wholesale and retail trade	16.7	.24	.05
Child development	Clerical workers in professional and related service	46.1	.28	.12
Fashion merchandising	Managers and administrators in wholesale and retail trade	26.0	.48	.13
	Sales workers in wholesale and retail trade	34.4	.43	.13
Landscape technology	Laborers in agriculture, forestry and fisheries	19.8	.17	.11
Farm equipment mechanics	Crafts workers in wholesale and retail trade	45.8	.47	.15

terms of both what graduates do on the job and where they perform the job. The data in Table 8 shows that the highest repeatability coefficient obtained was .48 for graduates of the fashion merchandising program who selected jobs included in the major occupational category of managers and administrators in the major industrial category of wholesale and retail trade. The lowest repeatability coefficient obtained was .17 for graduates of the landscape technology program selecting jobs in the major occupational category of laborers and the major industrial category of agriculture, forestry and fisheries.

Stability of the Selection of Related Jobs

According to the results presented in Table 9, the stability of the selection of training-related jobs also varied among programs. Assessment of the stability yielded a repeatability coefficient with a range of .27 for the fashion merchandising program to .68 for the landscape technology program. The percent of graduates selecting related jobs for these programs was 67.2 and 73.5, respectively. For the practical nursing program the percent of graduates who selected related jobs was 96.1 percent while the repeatability coefficient for such selection was only .30. The carpentry, accounting, and child development programs shared a relatively high repeatability coefficient in comparison to other programs in the sample. The coefficients for these programs were .51, .47, and .45, respectively.

Table 9

Repeatability Estimates for Selection of Jobs Related to Training for Each Program

Program	% Select related job	Repeatability coefficient	Standard error
Electronics technology	84.1	.40	.08
Welding	71.9	.39	.07
Practical nursing	96.1	.30	.07
Carpentry	85.4	.51	.09
Accounting	78.5	.47	.07
Child development	63.7	.45	.16
Fashion merchandising	67.2	.27	.11
Landscape technology	73.5	.68	.16
Farm power equipment mechanics	85.1	.36	.14

Chapter V.

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The impact of vocational education graduates on the labor market is a major factor in planning vocational education. Assessment of the stability of jobs selected by graduates in the past can aid in determining the level of confidence that can be placed in future projections. Consequently, assessment of the stability of job selection is an important step towards improving the process of planning for vocational education.

The purpose of this study was to describe the behavior of graduates from a sample of post-secondary vocational education programs in Minnesota. More specifically the study had two objectives: (1) to describe the jobs selected by graduates from a purposely selected sample of post-secondary vocational education programs, and (2) to assess stability in the types of jobs selected by graduates over a four-year period. The following sections include a discussion of results, conclusions and recommendations for using the results and for further research.

Discussion of Results

Assessment of the stability of job selection is an index of the level of confidence that planners of vocational education can place in projecting employment behavior of graduates into the future on the bases of past behavior. For example, using the data in Table 7 it is expected that in the future about 55 percent of the graduates from the electronic technology program will be employed in manufacturing industries and that the repeatability coefficient for that estimate is .48. In order to recognize the importance of a repeatability coefficient of .48, it would be necessary to establish standards for deciding what is a low, moderate, and high coefficient. To set standards would, in turn, require an understanding of the nature of variation in the data and the consequences of decisions based on the coefficients. This single research project did not provide enough experience with the nature of the data and the repeatability coefficient to set such standards with any level of confidence.

A second use of the repeatability coefficient is in comparing different vocational education programs. Again from Table 7, about 54 percent of the graduates from farm equipment mechanics selected jobs in the wholesale and retail trades with a stability coefficient of .31 as compared to 29 percent of the graduates from the accounting program selecting this same industrial category with a stability coefficient of .19. The inference is that the behavior of graduates from farm equipment mechanics was relatively more stable than that of accounting program graduates in terms of their selection of the industrial category, wholesale and retail trade.

A third use of the repeatability coefficient is in estimating the future job selection rate for graduates of a particular program and school. Refer again to the example of the electronics technology program where an average of 55 percent of the graduates were employed in the manufacturing industry with a repeatability coefficient of .48. Suppose one of the schools offering this program had 80 percent of their graduates enter the manufacturing industry in the past. What would be the expected percent of electronics technology graduates entering the manufacturing industry in a following year if all other things remained constant? The repeatability coefficient allows estimating that this percent would be 67 for the following year for this school. This estimate is derived as follows: (1) [(Percent entering manufacturing industry for selected school) - (Average percent entering manufacturing industry from all schools)] X [(Repeatability coefficient] = Expected future difference for selected school -- [(80% - 55%)] [.48] = 12%; and (2) (Average percent entering manufacturing industry from all schools) + (Expected future difference for selected school) = Expected future percent entering manufacturing for selected school -- (55%) + (12%) = 67%. In other words, in the following year it is expected that 12 percent more of this school's electronic technology program will select jobs in the manufacturing industry than the average for all schools with this program in the past which was 55 percent.

A fourth use of the repeatability coefficient is in estimating the increased predictability to be gained from multiple years records. That is, a very high coefficient indicates very little new information is likely to be gained from data for additional years, assuming that all

other things remain constant. Some of the "other things" to remain constant for this implication to hold are: (1) vocational programs under consideration remain the same in terms of purpose, curricula, and length of program, (2) schools do not alter dramatically their services, especially those services related to placement, and (3) the economic conditions related to growth or decline in industries and occupations employing graduates remains stable. If these conditions hold and the coefficient is high, there is less need for continuous collection of data from successive groups of graduates for the purposes addressed in this report.

Conclusions

The following conclusions appear warranted as a result of this study:

- While graduates of Minnesota's post-secondary programs each select jobs in a large number of different occupations and industries, a relatively few occupations and industries are selected by most graduates. Program graduates do seem to vary in the narrowness of their focus or the number of different occupations and industries which they tend to enter. For the programs included in this study, the number of different occupations selected varied from 31 for the child development program graduates to 103 for the electronic technology program graduates. The number of different industries selected varied from 7 for the practical nursing program to 152 for the accounting program. However, only 6 different occupations and 3 different industries were needed to reflect the choices of about 60 percent of the graduates in each program.
- Post-secondary vocational education programs in Minnesota differ in the proportion of graduates selecting jobs related to their training program. For the programs included in this study, the percent ranged from 63.7 for graduates of child development program to 96.1 percent for graduates of practical nursing program.
- The stability of jobs selected by graduates of post-secondary vocational education programs in Minnesota vary considerably between programs. In this study as an example, the repeatability coefficient for the selection of the occupation of carpenter by graduates

from the carpentry program was .28 as compared to a repeatability coefficient of .56 for graduates of the landscape technology program who selected the occupation of gardeners and groundskeepers.

Recommendations

As a result of this study, two types of recommendations are suggested. The first type indicate how the present findings can be applied in planning vocational education, and the second identify further research to be undertaken concerning the issue of stability.

Suggestions for practice include:

- Realize that graduates post-secondary vocational education program may enter several different occupations and industries, all of which may be related to the training program. Further, the graduates of different programs may enter the same occupations and industries. The implication is that the labor market demand for several different occupations and industries may be needed when planning the size and content of a particular program. And conversely, the impact of several different programs may need to be considered when trying to plan for meeting the labor market needs for a particular occupation or industry.
- Realize that graduates of some post-secondary vocational education programs do not enter the same types of jobs from year to year or from school to school. The implication is that it is very difficult to confidently plan the impact of these programs on the labor market. The use of labor market demand information for specific occupations or industries is of much less importance in planning these programs since program graduates appear to be very flexible in the rate at which they select various types of jobs.

Suggested further research include:

- Replicate this study with data from other vocational education programs, other geographic areas, other levels of vocational education (i.e., secondary, adult), to "get a feel" for the degree of stability to be expected.
- Set standards for low, moderate, and high repeatability coefficient

of job selection for use as an index of confidence in planning vocational education.

- Assess the stability of other characteristics (e.g., completion rates, labor force participation rates, sex ratios) of vocational education programs to determine if the practice of continuous collection of data is warranted.

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APPENDIX I:

STATISTICAL MODEL FOR ASSESSING THE STABILITY OF JOB SELECTION PATTERNS

Statistical Model

Stability of the selection of a specific job or a group of jobs by graduates from a specific program over a period of years can be assessed by deriving repeatability coefficient for such selection. Essentially, the repeatability coefficient is an intraclass correlation between repeated measurement of the same program over time. Such intraclass correlations can be derived by analysis of variances of the proportions of a programs graduates from particular years and schools who select particular jobs.

The analysis of variance is used to partition the total variance to variation between schools and variation within schools over years. The statistical model is as follows:

$$Y_{km} = U + \alpha_k + e_{km}$$

U = population mean

α_k = effect due to K^{th} school

e_{km} = error.

The analysis of variance table would be developed as follows:

Source of variation	Degrees of freedom	Means square	Expected mean square
Between schools	N-1	MS_w	$\sigma_e^2 + K_1 \sigma_w^2$
Within schools	N (M-1)	MS_e	σ_e^2

N = number of schools

M = number of measurements per school; equal number for each school.

$K_1 = M$

From the analysis of variance table:

$$\sigma_e^2 = MS_e$$

$$\sigma_w^2 = \frac{MS_w - MS_e}{K_1}$$

Hence, repeatability (R) = $\dfrac{\sigma_w^2}{\sigma_w^2 + \sigma_e^2}$.

In case of an unequal number of records per school, if we assume m_K = number of measurements taken from K^{th} school and m. = total number of measurements,

then $K_1 = \dfrac{1}{(N-1)} \left(m. - \dfrac{\sum m_K^2}{m.} \right)$.

Since the analysis is based on proportions, an angular transformation was recommended (Senedecor and Cochran, 1967). The purpose of the angular transformation was to spread out the proportions near zero and one to increase their variance. Another modification recommended was that of weighted analysis in the angular scale (Bartlett, 1947); Senedecor and Cochran (1967). The weighting was done because the proportion of graduates selecting particular jobs from each school and year combination for a particular program was based on widely varying number of total graduates. These empirical transformations were assumed to improve the quality of the data before calculating the repeatability coefficients.

An estimate of the standard error of repeatability coefficent could be calculated as

$$\text{S.E. (R)} = \sqrt{\frac{2\,(m.-1)\,(1-R)^2\,[1 + (K_1-1)\,R]^2}{K_1^2\,(m.-N)\,(N-1)}}\,.$$

This approximate estimate of standard error could be used in the case of unequal number of measurements.

Example of Calculating the Repeatability Coefficient

The repeatability coefficient for the selection of the occupation of carpenter by graduates of the carpentry program was calculated using follow-up data from 17 schools over four consecutive years. The total number of graduates from these carpentry programs who reported their occupation on the

follow-up form was 680. For each school and for each year the proportion of graduates who selected the occupation of carpenter was calculated. The over all percentage of graduates selecting the occupation of carpenter was 69.1 An angular transformation of the proportion was performed as recommended above. Table 10 shows the mean and standard deviation of the proportion of graduates selecting the occupation of carpenter in angular scale.

Table 10

Mean and Standard Deviation of Proportion of Carpentry Program Graduates Selecting Occupation of Carpentry Over Four Year Period

School number	Mean across years	Standard deviation across years	Total number of graduates selecting carpentry occupation
1	59.2	7.9	48
2	53.4	14.2	75
3	62.9	3.9	19
4	63.8	6.5	27
5	67.2	2.9	33
6	51.2	6.1	43
7	62.1	6.2	40
8	55.7	10.7	30
9	58.6	9.1	71
10	48.1	7.3	24
11	63.6	4.0	25
12	50.9	8.1	18
13	61.4	9.0	34
14	61.1	6.2	25
15	61.4	11.8	56
16	52.6	9.5	81
17	44.5	4.5	26
Total	57.2	10.5	680

The results of using analysis of variance on the transformed data from the carpentry program graduates is shown in Table 11. The analysis of variance results are used to calculate the repeatability coefficient as follows:

Table 11

Analysis of Variance of Transformed Proportions of Graduates From Carpentry Program in Each School and For Each Year Selecting Occupation of Carpenter

Source of variation	Degrees of freedom	Mean square	Expected mean square
Between Schools	16	1318.0	$\sigma_e^2 + K_1\sigma_w^2$
Within schools	663	81.2	σ_e^2
Total	680		

$$\sigma_e^2 = 81.2$$

$$\sigma_w^2 = \frac{1318.0-81.2}{K_1}$$

$$K_1 = \frac{1}{(N-1)}\left(m. - \frac{\sum m_k^2}{m.}\right)$$

N = Number of school = 17

m. = Total number of measurement = 680

$\sum m_k^2$ = The sum of the square of number of measurement taken from each school.

$$\sum m_k^2 = [(48)^2 + (75)^2 + (19)^2\ (27)^2 + (33)^2 + (43)^2 + \ldots.(26)^2]$$

$$\sum m_k^2 = 33442$$

$$K_1 = \frac{1}{16}\left(680 - \frac{33442}{680}\right) = 39.42$$

$$\sigma_w^2 = \frac{1318.0-81.2}{39.42} = 31.37$$

$$R = \frac{o_w^2}{\sigma_w^2 + \sigma_e^2} = \frac{31.37}{31.37 + 81.2} = .279$$

The repeatability coefficient for selecting the carpenter occupation by graduates of the carpentry program is equal to .279.

The standard area of this repeatability coefficient can be calculated as follows:

$$\text{S.E. } (R) = \sqrt{\frac{2(m.-1)\ (1-R)^2\ [1+\ (K_1-1)R]^2}{K_1{}^2(m.-N)\ (n-1)}}$$

$$\text{S.E. } (R) = \sqrt{\frac{2(680-1)\ (10.279)^2 + [1+(39.42-1).279]^2}{(39.42)^2\ (680-17)\ (17-1)}}$$

$$\text{S.E. } (R) = .077$$

The standard area of the repeatability coefficient estimates is an indicator of the variation which might be expected in future calculations of the repeatability coefficient for the same program. In this example, the estimation of .279 for the repeatability coefficient of selecting the occuaption of carpenter by the carpentry program graduates is expected to deviate by about $\pm$ .077 in future estimates when the same size of sample is utilitized.

APPENDIX II:

PORTION OF THE MINNESOTA VOCATIONAL FOLLOW-UP SYSTEM STUDENT QUESTIONNAIRE USED IN THIS STUDY

Minnesota Vocational Follow-Up System
4510 West 77th Street
Minneapolis, Minnesota 55435
(612) 831-1821

ED-01045-03

FOLLOW-UP QUESTIONNAIRE

PLEASE LEAVE ALL RED SQUARES BLANK

0 (1) 7 (2)

ALL RESPONSES WHICH YOU GIVE WILL BE KEPT STRICTLY CONFIDENTIAL

GENERAL DIRECTIONS

Please complete ALL sections that apply. When you have completed the form return it in the enclosed return-addressed, pre-paid envelope. Your frank response is very important in order that the area vocational-technical institutes may continue to improve their programs.

I. PERSONAL INFORMATION

A. Soc. Sec. No. (17 – 25)

B. Name _____ (Last) (First) (Middle)

C. Present Address _____ (Street or Rural Route)

_____ (City) (State) (Zip Code)

D. Home Phone _____ Work Phone _____

II. ADDITIONAL TRAINING

A. Since attending the area vocational-technical institute, what further educational training have you taken part in ?

Complete each box: If none enter a 0; If at sometime enter a 1; If currently enter a 2

27 ☐ On the-job training (employer-sponsored training program)

28 ☐ Public area vocational school programs

29 ☐ Private vocational programs

30 ☐ University, college and/or junior college programs

31 ☐ Apprenticeship

32 ☐ Specialized occupational military training

33 ☐ Other _____ (specify)

III. EMPLOYMENT INFORMATION - Present Status

A. Check only one of the following:

34 ☐ 1 Employed

☐ 2 Military

☐ 3 Unemployed – Looking for work

☐ 4 Unemployed – Not looking for work because: (check one)

35 ☐ 1 Disabled

☐ 2 In Training

☐ 3 Personal Enrichment, not interested in employment

☐ 4 Pregnant

☐ 5 Change in Marital Status

☐ 6 Unwilling to move

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IV. JOB INFORMATION: (IF YOU HAVE NOT BEEN EMPLOYED AT ANY TIME SINCE GRADUATION FROM THE VOCATIONAL-TECHNICAL INSTITUTE, SKIP TO SECTION IX, p.4.)

DIRECTIONS:

1. If you were employed or in the military at any time since graduating from the area vocational-technical institute, complete the following section of the questionnaire.
2. Please supply the requested information for each of the following jobs held during the time since graduating from the area vocational-technical institute. (Include names and addresses.)

(1) First Job
(First job after leaving vocational school)

Firm Name _____

What kind of business or industry was this? _____
(For example: Retail supermarket, dairy farm, road construction)

Firm Address _____

City/State _____ Zip _____

Job Title _____
(For example: TV repairman, cosmetologist, electrician, farm operator)

Job Duties _____
(For example: Type, file, sell cars, operate printing press, clean buildings)

Immediate Supervisor _____

Check one: (55)
- [1] Full-time job
- [2] Part-time job

Check one:
- [ ] Job related to training
- [ ] Job not related to training

Number of months in this job since graduation from vocational school. (56-57) [ ][ ]

Industrial Code [ ][ ][ ] (36-38)

Location [ ][ ][ ][ ][ ] (39-43)

O.E. Code [ ][ ][ ][ ][ ][ ] (44-49)

Occupational Code [ ][ ][ ] (50-52)

[ ] (53) [ ] (54)

Were you – (Mark one box) (58)

- Employee of private company, business or individual, for wages, salary, or commissions [1]
- Federal government employee [2]
- State government employee [3]
- Local government employee (city, county, etc) [4]
- Self-employed in own business, professional practice or farm [5]

(2) Present Job
(Job you are presently employed in. If same as first job, write SAME)

Firm Name _____

What kind of business or industry was this? _____
(For example: Retail supermarket, dairy farm, road construction)

Firm Address _____

City/State _____ Zip _____

Job Title _____
(For example: TV repairman, cosmetologist, electrician, farm operator)

Job Duties _____
(For example: Type, file, sell cars, operate printing press, clean buildings)

Immediate Supervisor _____

Check one: (78)
- [1] Full-time job
- [2] Part-time job

Check one:
- [ ] Job related to training
- [ ] Job not related to training

Number of months in this job since graduation from vocational school. (79-80) [ ][ ] [0][8]

Industrial Code [ ][ ][ ] (59-61)

Location [ ][ ][ ][ ][ ] (62-66)

O.E. Code [ ][ ][ ][ ][ ][ ] (67-72)

Occupational Code [ ][ ][ ] (73-75)

[ ] (76) [ ] (77)

Were you – (Mark one box) (3)

- Employee of private company, business or individual, for wages, salary, or commissions [1]
- Federal government employee [2]
- State government employee [3]
- Local government employee (city, county, etc) [4]
- Self-employed in own business, professional practice or farm [5]

(3) How many jobs, including your first and present job, have you had since leaving the area vocational-technical institute? [ ] 4

V. ADVANCEMENT INFORMATION

A. Have you had a formal advancement in job classification (other than just salary increases) since taking your first job after leaving the area vocational-technical institute?

YES [1] NO [2] 5

B. NOTE: The following item need not be completed if you prefer not to complete it. Please do not include overtime when calculating your monthly salary. (Check the appropriate squares.)

Salary Range Before Deductions (Not Take-Home Pay)	Under $300 mo. ($1.75/hr)	Up to $400 mo. ($2.30/hr)	Up to $500 mo. ($2.90/hr)	Up to $600 mo. ($3.45/hr)	Up to $700 mo. ($4.00/hr)	Up to $800 mo. ($4.65/hr)	Up to $900 mo. ($5.25/hr)	Up to $1000 mo. ($5.80/hr)	Up to $1100 mo. ($6.40/hr)	Up to $1200 mo. ($7.00/hr)	Up to $1300 mo. ($7.50/hr)	
First Job Monthly Salary Range												6-7
Present Job Monthly Salary Range												8-9
	01	02	03	04	05	06	07	08	09	10	11	

APPENDIX III:

MAJOR OCCUPATIONAL AND INDUSTRIAL CATEGORIES OF JOBS SELECTED BY GRADUATES OF SAMPLED POST-SECONDARY VOCATIONAL EDUCATION PROGRAMS FOR SCHOOL YEARS 1973-74 TO 1976-77

Table 1

Major Occupational Categories Selected by Graduates of Electronics Technology, School Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	39.7	28.0	37.9	61.0	40.6
Managers and administrators exc. farm	4.0	6.5	4.2	2.3	4.4
Sales workers	0.8	2.7	2.6	1.4	1.9
Clerical workers	1.6	3.1	2.6	0.0	1.9
Crafts workers	43.7	49.8	42.8	27.7	41.7
Operatives	4.0	3.9	4.8	2.3	3.9
Laborers except farm	2.8	4.2	2.3	3.8	3.2
Farmers, farm managers and farm laborers	0.0	0.4	1.0	0.0	0.9
Service workers exc. household	1.6	1.5	1.9	0.9	1.6
Private household workers	0.0	0.0	0.0	0.0	0.0
Total	100%	100%	100%	100%	100%
Number of graduates reporting	247	261	311	213	1032

Table 2

Major Occupational Categories Selected by Graduates of Welding, School Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	0.5	1.7	3.1	1.2	1.9
Managers and administrators exc. farm	1.0	2.2	1.8	2.3	1.9
Sales workers	0.5	0.0	1.0	2.0	1.0
Clerical workers	0.5	1.1	3.1	2.0	2.0
Crafts workers	13.0	16.2	18.2	13.7	15.7
Operatives	74.1	69.3	59.6	68.0	66.1
Laborers except farm	4.1	5.0	7.4	7.0	6.3
Farmers, farm managers and farm laborers	4.1	1.7	2.8	3.2	3.0
Service workers exc. household	2.1	2.8	3.1	0.8	2.3
Private household workers	0.0	0.0	0.0	0.0	0.0
Total	100%	100%	100%	100%	100%
Number of graduates reporting	193	179	391	256	1019

Table 3

Major Occupational Categories Selected by Graduates of Practical Nursing, School Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	0.0	0.0	0.8	0.0	0.2
Managers and administrators exc. farm	0.3	0.0	0.5	0.0	0.2
Sales workers	0.3	0.3	0.3	0.3	0.3
Clerical workers	1.5	0.9	2.3	2.3	1.8
Crafts workers	0.0	0.0	0.0	0.0	0.0
Operatives	0.6	0.3	0.5	0.6	0.5
Laborers except farm	0.1	0.0	0.0	0.3	0.1
Farmers, farm managers and farm laborers	0.0	0.0	0.2	0.0	0.0
Service workers exc. household	97.2	98.4	95.5	96.6	96.7
Private household workers	0.0	0.0	0.0	0.0	0.0
Total	100%	100%	100%	100%	100%
Number of graduates reporting	725	318	651	351	2045

Table 4

Major Occupational Categories Selected by

Graduates of Carpentry, School

Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	0.6	0.0	1.1	0.0	0.4
Managers and administrators exc. farm	7.2	9.0	7.6	0.0	6.4
Sales workers	0.0	2.1	1.1	0.8	1.0
Clerical workers	0.0	1.6	1.1	1.5	1.0
Crafts workers	74.4	71.8	78.9	90.1	77.9
Operatives	7.2	3.2	3.2	0.8	3.8
Laborers except farm	6.7	8.0	3.8	5.3	6.0
Farmers, farm managers and farm laborers	1.7	0.5	0.0	1.5	0.8
Service workers exc. household	2.2	3.2	3.2	0.0	2.3
Private household workers	0.0	0.5	0.0	0.0	0.1
Total	100%	100%	100%	100%	100%
Number of graduates reporting	180	188	185	131	684

Table 5

Major Occupational Categories Selected by

Graduates of Accounting, School

Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	16.1	16.4	7.8	8.5	12.0
Managers and administrators exc. farm	8.6	5.0	6.7	7.3	6.9
Sales workers	2.6	3.4	2.8	2.0	2.7
Clerical workers	57.6	62.5	65.9	71.1	64.3
Crafts workers	0.6	0.9	2.8	1.8	1.6
Operatives	7.8	4.6	6.5	3.5	5.6
Laborers except farm	2.6	3.1	2.6	1.2	2.4
Farmers, farm managers and farm laborers	0.9	0.9	0.6	0.9	0.8
Service workers exc. household	3.2	3.1	4.4	3.5	3.6
Private household workers	0.0	0.0	0.0	0.3	0.0
Total	100%	100%	100%	100%	100%
Number of graduates reporting	347	323	387	342	1399

Table 6

Major Occupational Categories Selected by Graduates of Child Development, School Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	0.7	0.0	0.0	4.3	1.1
Managers and administrators exc. farm	0.0	0.0	1.5	0.0	0.4
Sales workers	1.4	8.1	4.5	4.3	4.3
Clerical workers	58.6	57.6	62.7	50.5	57.9
Crafts workers	2.1	3.0	0.0	0.0	1.3
Operatives	6.4	6.1	6.0	3.2	5.6
Laborers except farm	0.0	1.0	2.2	1.1	1.1
Farmers, farm managers and farm laborers	0.0	0.0	0.0	0.0	0.0
Service workers exc. household	28.6	19.2	21.6	33.3	25.5
Private household workers	2.1	5.1	1.5	3.2	2.8
Total	100%	100%	100%	100%	100%
Number of graduates reporting	140	99	134	93	466

Table 7

Major Occupational Categories Selected by Graduates of Fashion Merchandising, School Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	1.3	2.2	2.0	0.0	1.6
Managers and administrators exc. farm	30.8	28.9	24.8	20.5	26.8
Sales workers	34.6	31.1	34.7	54.5	36.4
Clerical workers	15.4	22.2	18.8	13.6	18.2
Crafts workers	6.4	2.2	2.0	0.0	2.9
Operatives	3.8	4.4	8.9	2.3	5.4
Laborers except farm	0.0	2.2	1.0	0.0	1.0
Farmers, farm managers and farm laborers	0.0	0.0	0.0	0.0	0.0
Service workers exc. household	7.7	6.7	7.9	9.1	7.7
Private household workers	0.0	0.0	0.0	0.0	0.0
Total	100%	100%	100%	100%	100%
Number of graduates reporting	78	90	101	44	313

Table 8

Major Occupational Categories Selected by

Graduates of Landscape Technology,

School Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	0.0	2.2	0.0	0.0	0.6
Managers and administrators exc. farm	8.5	18.0	5.7	9.3	10.4
Sales workers	3.4	4.5	4.8	6.7	4.9
Clerical workers	6.8	5.6	13.3	8.0	8.8
Crafts workers	23.7	12.4	19.0	6.7	15.2
Operatives	6.8	5.6	11.4	12.0	9.1
Laborers except farm	39.0	42.7	32.4	48.0	39.9
Farmers, farm managers and farm laborers	6.8	4.5	8.6	8.0	7.0
Service workers exc. household	5.1	4.5	4.8	1.3	4.0
Private household workers	0.0	0.0	0.0	0.0	0.0
Total	100%	100%	100%	100%	100%
Number of graduates reporting	59	89	105	75	328

Table 9

Major Occupational Categories Selected by Graduates of Farm Power Equipment Mechanic, School Years 1973/74 To 1976/77

Occupational categories	Percent selecting occupation				
	1973/74	1974/75	1975/76	1976/77	Total
Professional, technical workers	0.0	0.0	0.0	0.0	0.0
Managers and administrators exc. farm	3.2	1.6	5.6	1.7	2.6
Sales workers	0.0	1.6	5.6	1.7	2.1
Clerical workers	3.2	0.0	0.0	0.0	0.5
Crafts workers	67.7	60.9	50.0	61.0	60.0
Operatives	6.5	12.5	8.3	6.8	8.9
Laborers except farm	0.0	3.1	2.8	6.8	3.7
Farmers, farm managers and farm laborers	16.2	20.3	27.8	22.1	21.6
Service workers exc. household	3.2	0.0	0.0	0.0	0.5
Private household workers	0.0	0.0	0.0	0.0	0.0
Total	100%	100%	100%	100%	100%
Number of graduates reporting	31	64	36	59	190

Table 10

Major Industrial Categories Selected by Graduates of Electronics Technology, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	1.7	0.4	1.3	0.9	1.1
Mining	0.9	0.8	2.6	1.4	1.5
Construction	2.2	4.7	2.3	2.8	3.0
Manufacturing	58.9	39.9	59.9	62.4	55.1
Transportation, Communication, and public utilities	6.9	15.6	6.8	9.9	9.7
Whole sale and retail trade	21.2	25.4	15.3	12.7	18.7
Finance insurance and real estate	0.0	0.0	0.7	0.0	0.2
Business and repair services	4.3	5.5	5.5	4.2	5.0
Personal service	0.0	0.4	0.3	0.0	0.2
Professional and related services	3.5	3.1	2.9	4.2	3.4
Public administration	0.4	4.3	2.3	1.4	2.2
Total	100%	100%	100%	100%	100%
Number of graduates reporting	231	256	307	213	1007

Table 11

Major Industrial Categories Selected by Graduates of Welding, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	6.1	2.3	3.7	3.9	3.9
Mining	1.7	5.2	0.8	1.6	2.0
Construction	8.9	5.8	8.7	8.2	8.1
Manufacturing	66.1	67.4	57.7	59.4	61.5
Transportation, Communication, and public utilities	3.3	4.1	8.7	7.4	6.5
Whole sale and retail trade	7.2	6.4	7.0	5.1	6.4
Finance insurance and real estate	0.0	0.0	1.1	0.8	0.6
Business and repair services	3.9	4.1	5.9	7.0	5.5
Personal service	0.6	0.0	0.3	0.4	0.3
Professional and related services	1.7	1.2	2.8	2.7	2.3
Public administration	0.6	3.5	3.1	3.5	2.8
Total	100%	100%	100%	100%	100%
Number of graduates reporting	180	172	355	256	963

Table 12

Major Industrial Categories Selected by Graduates of Practical Nursing, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	0.1	0.0	0.2	0.0	0.1
Mining	0.0	0.0	0.0	0.0	0.0
Construction	0.0	0.0	0.0	0.3	0.0
Manufacturing	0.6	0.0	0.8	1.1	0.6
Transportation, Communication, and public utilities	0.1	0.3	0.2	0.3	0.2
Whole sale and retail trade	1.7	0.9	1.2	1.4	1.4
Finance insurance and real estate	0.1	0.0	0.3	0.3	0.2
Business and repair services	0.0	0.6	0.5	0.3	0.3
Personal service	0.3	0.0	0.3	0.3	0.2
Professional and related services	96.5	98.1	96.3	96.0	96.6
Public administration	0.6	0.0	0.3	0.0	0.3
Total	100%	100%	100%	100%	100%
Number of graduates reporting	723	318	651	351	2043

Table 13

Major Industrial Categories Selected by

Graduates of Carpentry, School

Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	2.8	1.1	0.5	1.5	1.5
Mining	0.0	0.5	0.0	0.0	0.1
Construction	76.5	76.2	72.1	82.6	76.4
Manufacturing	7.3	7.4	12.0	7.6	8.6
Transportation, Communication, and public utilities	3.9	0.5	0.5	0.0	1.3
Whole sale and retail trade	5.0	6.9	7.1	6.1	6.3
Finance insurance and real estate	0.0	0.5	1.1	0.0	0.4
Business and repair services	1.1	0.5	1.1	0.0	0.7
Personal service	1.1	0.5	0.0	0.8	0.6
Professional and related services	1.7	4.2	3.3	0.0	2.5
Public administration	0.6	1.6	2.2	1.5	1.5
Total	100%	100%	100%	100%	100%
Number of graduates reporting	179	189	183	132	683

Table 14

Major Industrial Categories Selected by Graduates of Accounting, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	1.7	1.7	1.5	1.2	1.5
Mining	0.7	0.3	0.3	0.3	0.4
Construction	4.0	2.8	1.8	3.5	3.0
Manufacturing	22.2	23.3	22.1	19.0	21.6
Transportation, Communication, and public utilities	3.0	3.5	5.3	2.9	3.7
Whole sale and retail trade	29.3	30.0	29.5	27.2	28.9
Finance insurance and real estate	11.4	9.4	15.0	22.5	14.9
Business and repair services	2.0	2.4	1.2	3.8	2.4
Personal service	1.3	0.7	2.1	1.8	1.5
Professional and related services	16.8	14.6	11.8	14.0	14.2
Public administration	7.4	11.1	9.4	3.8	7.8
Total	100%	100%	100%	100%	100%
Number of graduates reporting	297	287	339	342	1265

Table 15

Major Industrial Categories Selected by Graduates of Child Development, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	0.7	2.0	0.0	0.0	0.6
Mining	0.0	0.0	0.0	0.0	0.0
Construction	0.0	0.0	0.0	0.0	0.0
Manufacturing	8.6	7.1	6.6	2.2	6.4
Transportation, Communication, and public utilities	0.0	1.0	0.0	2.2	0.6
Whole sale and retail trade	6.4	20.2	15.4	14.0	13.5
Finance insurance and real estate	1.4	0.0	4.4	3.2	2.4
Business and repair services	1.4	0.0	1.5	0.0	0.9
Personal service	1.4	6.1	3.7	7.5	4.3
Professional and related services	77.1	57.6	63.2	68.8	67.3
Public administration	2.9	6.1	5.1	2.2	4.1
Total	100%	100%	100%	100%	100%
Number of graduates reporting	140	99	136	93	468

Table 16

Major Industrial Categories Selected by Graduates of Fashion Merchandising, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	1.3	0.0	1.0	0.0	0.6
Mining	0.0	0.0	0.0	0.0	0.0
Construction	0.0	0.0	0.0	0.0	0.0
Manufacturing	9.2	9.2	10.9	2.3	8.8
Transportation, Communication, and public utilities	1.3	1.1	5.0	0.0	2.3
Whole sale and retail trade	71.1	79.3	62.4	93.2	73.7
Finance insurance and real estate	6.6	1.1	8.9	0.0	4.9
Business and repair services	1.3	0.0	2.0	0.0	1.0
Personal service	2.6	2.3	2.0	0.0	1.9
Professional and related services	6.6	5.7	6.9	4.5	6.2
Public administration	0.0	1.1	1.0	0.0	0.6
Total	100%	100%	100%	100%	100%
Number of graduates reporting	76	87	101	44	308

Table 17

Major Industrial Categories Selected by Graduates of Landscape Technology, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	52.5	47.1	43.8	41.9	45.8
Mining	0.0	0.0	0.0	0.0	0.0
Construction	0.0	1.1	2.9	1.4	1.5
Manufacturing	3.4	6.9	12.4	12.2	9.2
Transportation, Communication, and public utilities	3.4	2.3	0.0	2.7	1.8
Whole sale and retail trade	5.1	9.2	7.6	18.9	10.2
Finance insurance and real estate	0.0	3.4	2.9	5.4	3.1
Business and repair services	3.4	1.1	2.9	1.4	2.2
Personal service	0.0	2.3	1.0	0.0	0.9
Professional and related services	30.5	14.9	16.2	14.9	18.2
Public administration	1.7	11.5	10.5	1.4	7.1
Total	100%	100%	100%	100%	100%
Number of graduates reporting	59	87	105	74	325

Table 18

Major Industrial Categories Selected by Graduates of Farm Power Equipment Mechanic, School Years 1973/74 To 1976/77

Industrial categories	Percent selecting industry				
	1973/74	1974/75	1975/76	1976/77	Total
Agriculture, forestry, and fisheries	17.2	24.1	34.4	25.0	25.1
Mining	0.0	0.0	0.0	0.0	0.0
Construction	0.0	3.4	6.3	5.0	3.9
Manufacturing	10.3	8.6	9.4	8.3	8.9
Transportation, Communication, and public utilities	0.0	1.7	0.0	0.0	0.6
Whole sale and retail trade	51.7	58.6	46.9	55.0	54.2
Finance insurance and real estate	0.0	0.0	0.0	0.0	0.0
Business and repair services	17.2	3.4	3.1	5.0	6.1
Personal service	0.0	0.0	0.0	0.0	0.0
Professional and related services	0.0	0.0	0.0	0.0	0.0
Public administration	3.4	0.0	0.0	1.7	1.1
Total	100%	100%	100%	100%	100%
Number of graduates reporting	29	58	32	60	179